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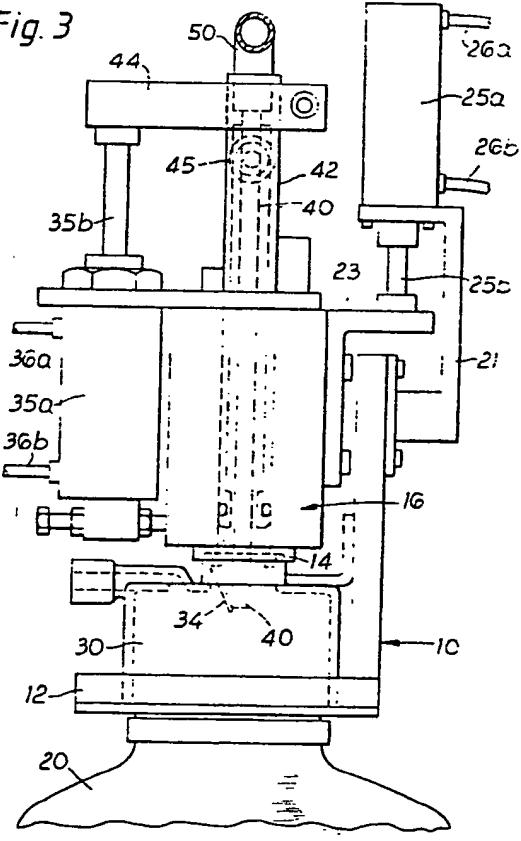
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(54) Apparatus for filling containers

(57) A fill head unit (16) provides means, e.g. sealing lip (14), for forming a seal around an inlet in a container cap (30) or container neck. A finger, which may be constituted by the lower end of a liquid supply nozzle (40), is mounted in the fill head (16) in axially movable manner and is protrudable therefrom into the cap or neck, within the region defined by the seal, to open a flap valve (34) in the inlet. The arrangement is such that after filling of the container the seal can only be released after the finger (40) has been retracted, enabling the valve (34) to close off the inlet of the container. The container may comprise a bag of elastomeric material disposed within a blow-moulded plastics bottle.

Fig. 3



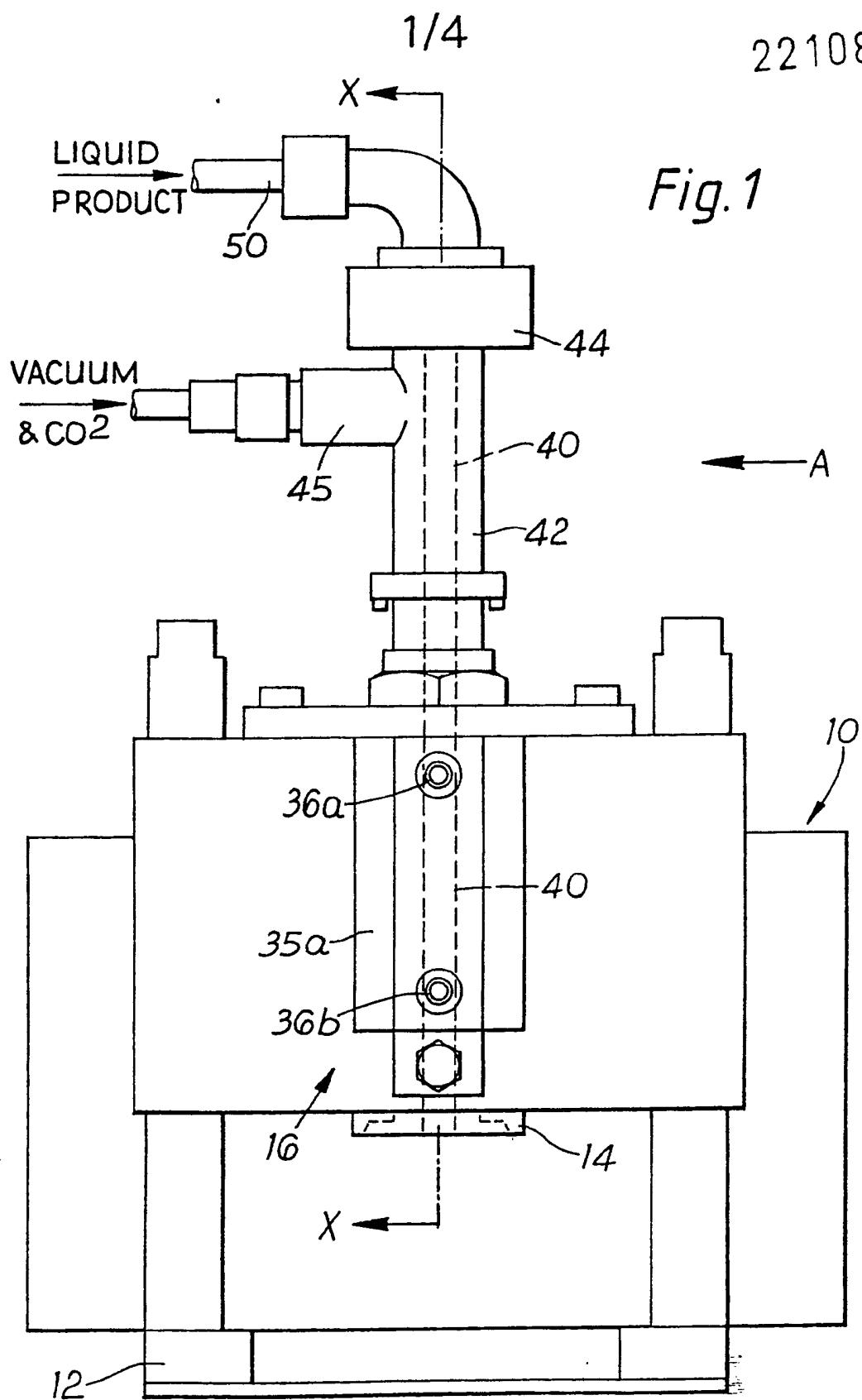
At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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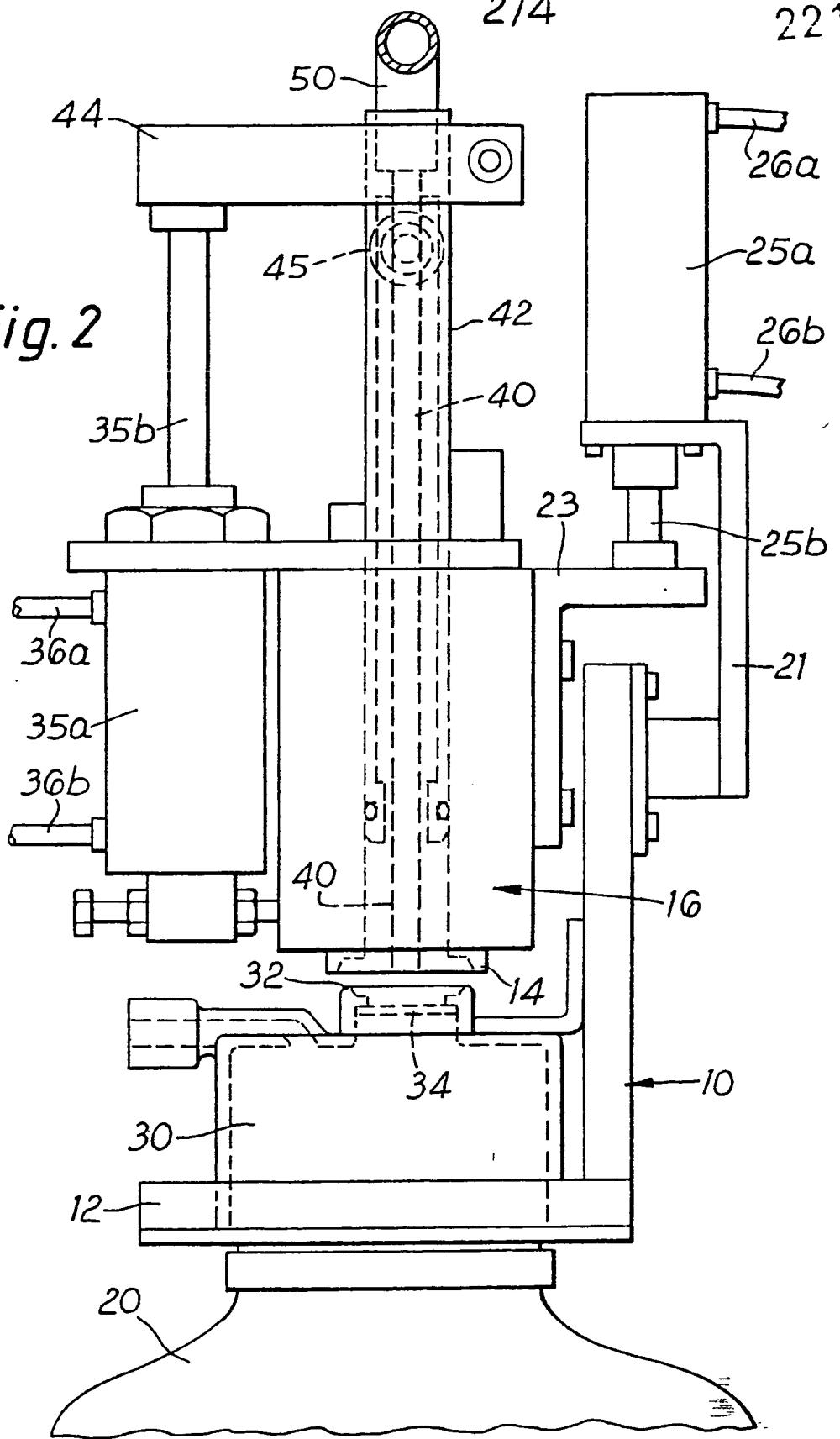
Fig. 1



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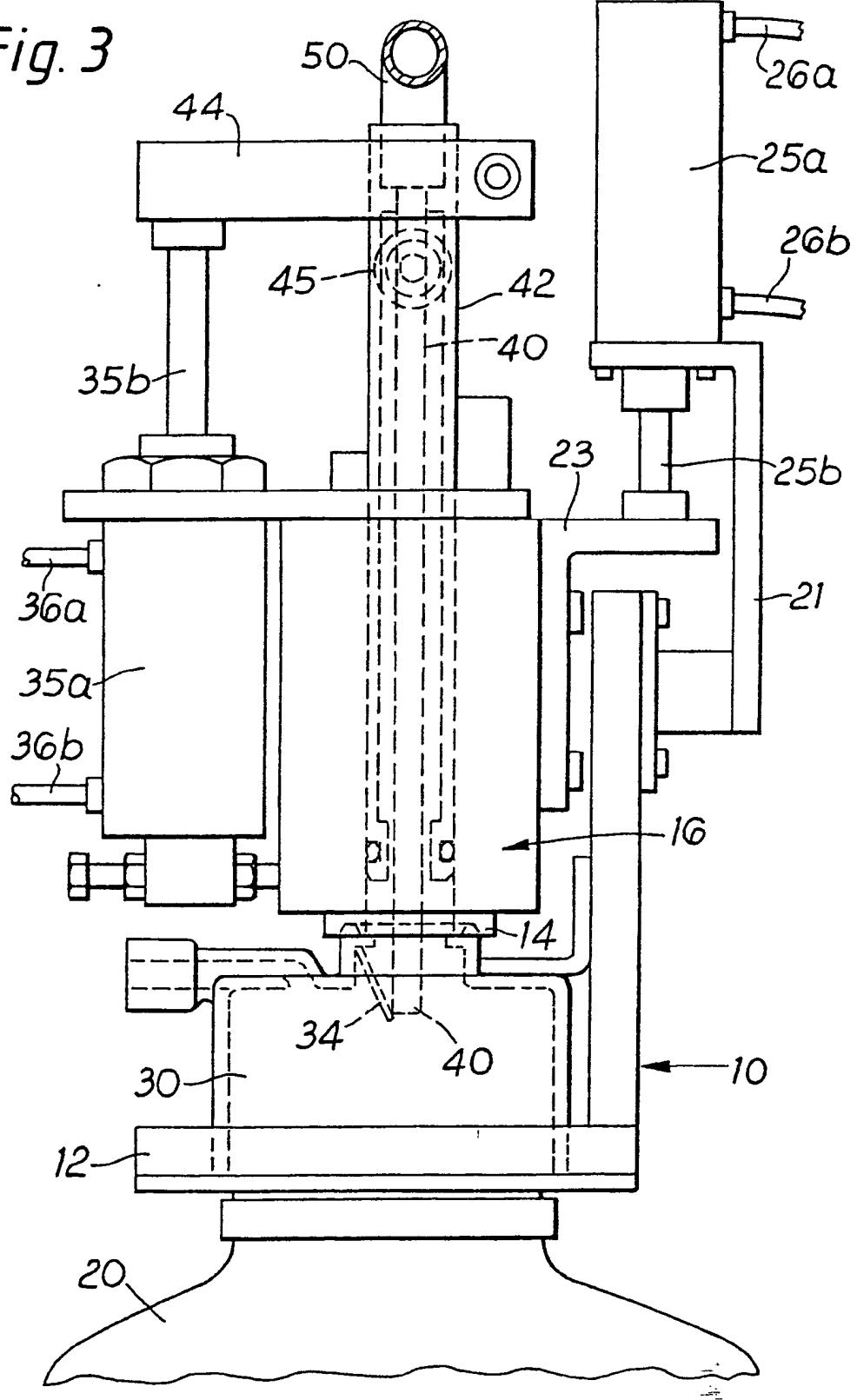
Fig. 2



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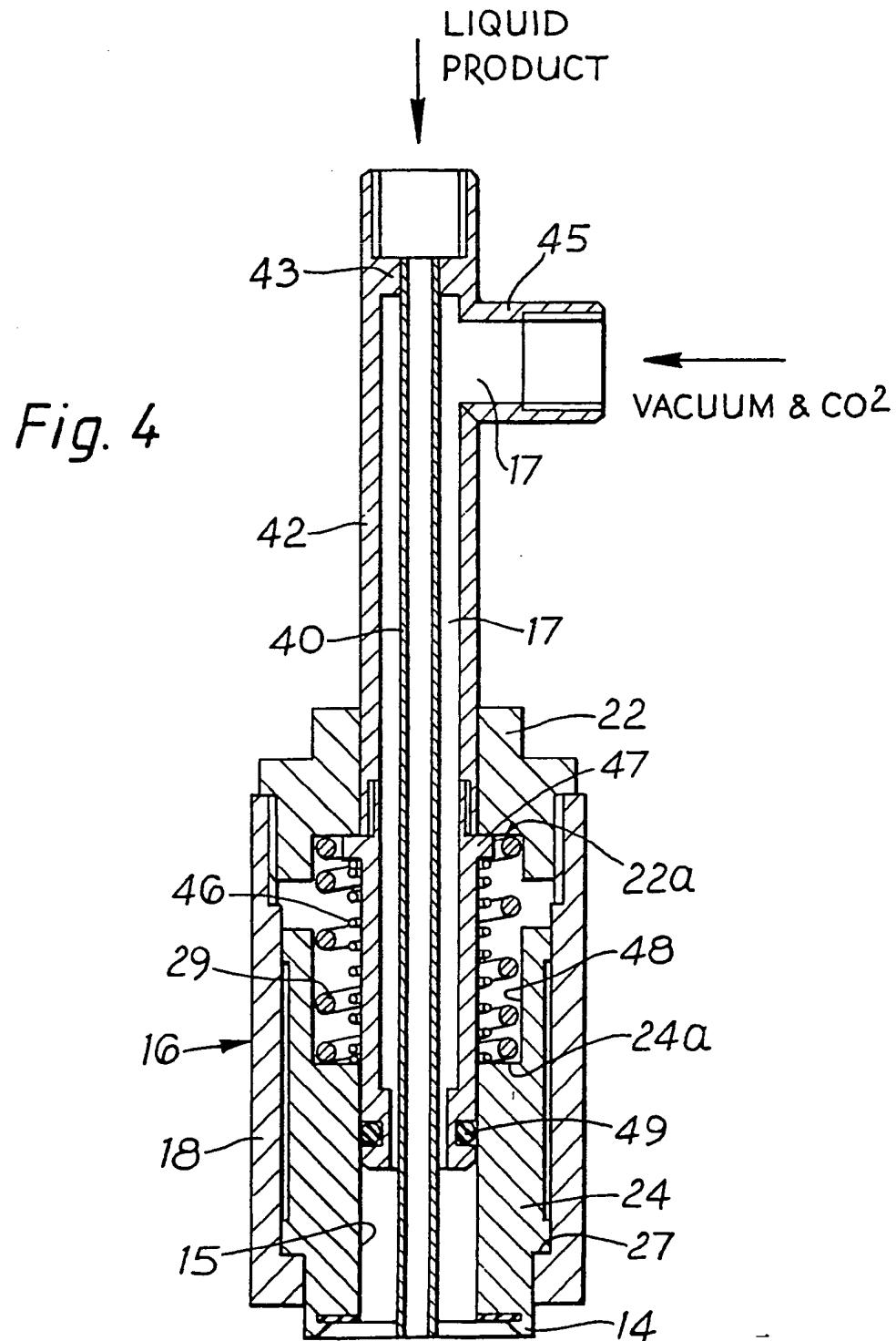
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Fig. 3



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APPARATUS FOR FILLING CONTAINERS

This invention relates to apparatus for filling containers and is particularly but not exclusively adapted for filling containers of the type comprising a bag of elastomeric material disposed within a rigid or semi-rigid casing, such as a blow-moulded plastics bottle. The interior of the bag is in communication with an inlet/outlet opening in the casing and is capable of expansion within the confines of the casing upon filling with liquid and of contraction by its own resilience to discharge liquid via the opening. Seated in or on the opening in the casing and connected to the mouth of the bag is a cap through which there is an inlet aperture or passageway, closed by a one way valve, such as a simple flap valve, through which the assembled container may be filled. The cap may also incorporate dispensing valve means, but that is not relevant to the present invention.

When the bag is to be used to contain a liquid beverage e.g. beer, soft drinks, it will be evacuated prior to filling to remove oxygen which might lead to spoilage of the product during storage. It may then be inflated by nitrogen or carbon dioxide until it is in intimate contact with the interior of the casing before the liquid itself is supplied. Alternatively, it may

just be inflated by the pressure of the liquid itself.

Any apparatus for filling such a container must incorporate means for opening the one way valve in the cap and should allow for selective connection of a vacuum source, a source of nitrogen or carbon dioxide, or a supply of the liquid.

The present invention provides filling apparatus comprising a fill head unit providing means for forming a seal around an inlet opening in a container cap or a container neck and a finger which is mounted in the fill head unit in axially movable manner and is protrudable therefrom, into the cap or neck, within the region defined by the seal, e.g. to open any inlet valve therein, the apparatus being so constructed that the seal can only be released after the finger has been retracted. Such construction enables the valve to close prior to release of the seal so as to prevent escape of liquid from the container.

The finger is preferably constituted by the end region of a liquid supply pipe or nozzle which is mounted in the fill head unit in axially movable manner.

Moreover, the finger, or the pipe or nozzle of which it forms part, preferably extends right through the fill head unit which provides the sealing means.

Furthermore, the finger, or the pipe or nozzle of which it forms part is preferably spring biassed into its retracted position.

The finger and the sealing means are advantageously actuatable by an interlinked pneumatic or hydraulic mechanism.

The accompanying drawings illustrate a practical embodiment of the filling apparatus of the invention.

In the drawings:-

Fig. 1 is a schematic front view of the apparatus;

Fig. 2 is a side view in the direction A in Fig. 1, the apparatus being in the loading position and the finger being retracted;

Fig. 3 corresponds to Fig. 2 but shows the apparatus in the filling position sealed with the container and with the finger projecting downwards; and

Fig. 4 is a cross-section along the line X-X in Fig. 1.

With reference to Figs. 1, 2 and 3, the apparatus comprises a stationary frame 10 including a recessed part 12 adapted to receive the neck of a container 20 or a cap 30 fitted thereon.

A fill head unit 16 is mounted on the frame 10 by way of L-shaped brackets 21,23 and a pneumatically operable

piston and cylinder arrangement 25. In this respect, the bracket 21 has one limb fixed to the frame 10 and its other limb fixed to the cylinder 25a, which is supported thereon. The other bracket 23 has one limb fixed to the fill head unit 16 and its other limb fixed to the end of the piston 25b. The fill head unit 16 is therefore vertically movable relative to the frame 10 as the piston 25b moves axially relative to the cylinder 25a under the influence of compressed air from lines 26a, 26b.

As illustrated in Fig. 4, the unit 16 comprises a cylindrical housing 18, to which the bracket 23 is affixed, as just mentioned, within which upper and lower cylindrical inserts 22, 24 are mounted. The upper insert 22 is a close friction fit into the top of the housing 18. The lower insert 24 is a sliding fit in the housing 18 and is retained therein only by an internal shoulder 27 formed adjacent the bottom of the housing 18. A gap remains between the inserts 22, 24 in their normal position, such that, upon application of force from below, the lower insert 24 can be urged upwards towards the upper insert 22. In this respect, adjacent end regions of the respective inserts 22, 24 are recessed, as at 48, to provide facing angular shoulders 22a, 24b, between which a helical spring 29 is confined, the spring 29 biasing the lower insert 24 away from the upper insert 22 into its lowermost position abutting the

shoulder 27. Thus when force is applied from below to the insert 24 it has to overcome the bias of the spring 29 to move the insert 24 upwards into the housing 18.

Both inserts 22,24 are cylindrical in form, as mentioned, having respective bores 15 therethrough. Sealing means is constituted by an annular sealing lip 14 provided on the underside of the lower insert 24 of the fill head unit 16.

As best shown in Fig. 4, an elongate pipe 40, the lower end of which constitutes a finger for opening a flap valve 34 disposed in a filling aperture 32 of the cap 30, extends right through the fill head unit 16. This pipe 40 is fixedly mounted within a sleeve 42 such that an annular passage 17 remains therebetween. In this respect, the upper end of the pipe 40 is secured to an internal flange 43 of the sleeve 42 so as to close off the top of the passage 17, while the lower end of pipe 40 extends a considerable distance beyond the lower end of the sleeve 42. At the bottom, the passage 17 opens into the bore 15 in the lower insert 24. The sleeve 42 is slidable within the bores 15 of the housing inserts 22,24. A further helical spring 46 encircles the sleeve 42 and is accommodated in the recessed regions 48 of the inserts 22,24 inside the spring 29. This further spring 46 acts between the shoulder 24a of the lower insert 24 and an outwardly extending annular

flange 47 of the sleeve 42 to bias the sleeve 42, and the pipe 40 fixed therein, into an upper position in which the lower end of the pipe 40 is retracted relative to the housing 18 to a position level with or above the sealing lip 14. An O-ring 49 accommodated in an external groove adjacent the lower end of the sleeve 42 seals the sleeve 42 relative to the lower insert 24 at a level below the recess 48.

As shown in Figs. 2 and 3, the upper end of the sleeve 42, at a distance above the fill head unit 16, is connected to a collar 44.

A second pneumatically operable cylinder 35a is mounted on the outside of the fill head housing 18 with a piston 35b extending upwardly and connected at its end, to the aforesaid collar 44. Thus the sleeve 42, and the pipe 40 which is fixedly located therein, are caused to move vertically relative to the fill head unit 16, against the bias of the spring 46, when the piston 35b moves axially relative to the cylinder 35a under the influence of compressed air from lines 36a, 36b.

A proximity switch (not shown) is secured to the frame 10 so as to sense when the collar 44 moves downwards beyond the level of said switch. The level is chosen so that the switch is only operated when the piston and cylinder 35a, 35b have acted to draw the collar 44, and

hence the nozzle 40, downwards to their lower position.

A photoelectric sensor (not shown) is positioned to detect the presence of a bottle 20 or its cap 30 in the fill position and to actuate a sterilant spray directed at the vicinity of the inlet aperture 32 in the cap 30.

As indicated in Fig. 1, the nozzle 40 is connected at its upper end to a liquid product supply line 50, whilst the sleeve 42 has a lateral branch 45 whereby the channel 17 through the sleeve 42 is connected to a source of CO₂ or vacuum. The liquid product supply line 50 is provided with a solenoid actuated shut-off valve (not shown) and with a fluid flow pressure sensor (not shown). A pump (not shown) is provided to supply the liquid product from a reservoir, via the line 50 to the nozzle 40.

The photoelectric sensor, the CO₂ and vacuum source, the compressed air supply to the cylinders 25a,35a, the proximity switch, the pump power supply, the solenoid valve and the pressure sensor, are all operatively interconnected via electrical circuit means incorporating timers.

The sequence of operation of the illustrated machine is as follows:

A bottle 20 is firstly placed into the fill position

by an operative. This is sensed by the photoelectric sensor which actuates the sterilant spray directed to the vicinity of the cap opening 32. A start button is then pressed by the operative. This opens the compressed air supply to the cylinders 25a, 35a, more specifically to the lines 26a, 36a to move the respective pistons 25b, 35b downwards. However, the diameters of the lines 26a and 36a (or the cylinder inlets) are so chosen, with the line 36a narrower than the line 26a that air is supplied at a slower rate to the cylinder 35a. This ensures that the nozzle 40 and the sleeve 42, driven by the piston 35b, always move down slightly after the fill head unit 16, driven by the piston 25b, with the result that the sealing lip 14 always seals around the opening 32 of the cap 30 before the end of the nozzle moves downwards therethrough to open the flap valve 34.

As the nozzle 40 approaches its lower position, the collar 44 passes into the range of the proximity sensor which acts to shut off the sterilant spray and initiate the timers in the circuit. A timed sequence of supply of vacuum pressure, CO₂, then vacuum pressure via the channel 17 then ensues. A sequence lasting a total of 15 seconds has been found suitable, namely 7 second evacuation of the container, 1 second purging with CO₂, and a further 7 second evacuation. In this respect this filling equipment is designed for a container of the

type described in the introduction and it is an elastomeric bag inside the bottle 20 which is thus evacuated and purged and which is subsequently filled, as now explained.

Once the aforesaid sequence is complete, the relevant timer times out and a further timer switches on power supply to the liquid supply pump and opens the solenoid valve in the supply line 50. The bag within the bottle 20 is then filled via the nozzle 40. Once the bag is filled, it exerts an inward pressure on the liquid it contains, due to the inherent resilience of the material of which it is made. When a predetermined back pressure is reached this is detected by the pressure sensor in the supply line 50, which acts to stop the pump, close the solenoid valve and switch over supply of compressed air to the respective cylinders 25a, 35a to the lines 26b, 36b. As the line 36b is of a considerably narrower diameter than the line 26b the rate of air supply to the cylinder 35a is slower than to the cylinder 25a. This ensures that the nozzle 40 and the sleeve 42, driven by the piston 25b, always move upwards and retract relative to the fill head 16, sufficient to enable closure of the valve 34 (again due to liquid counterpressure), before the sealing lip 14 is lifted from the cap by upward movement of the fill head unit 16, driven by the piston 35b.

As the collar 44 passes the proximity switch the sterilant spray is re-activated until the photoelectric sensor shuts it off upon sensing removal of the bottle 20 from the fill position.

Naturally, other mechanisms could be devised for comparable sequential operation of the fill nozzle and seal.

CLAIMS:

1. Filling apparatus comprising a fill head unit providing means for forming a seal around an inlet opening in a container cap or container neck and a finger which is mounted in the fill head unit in axially movable manner and is protrudable therefrom, into the cap or neck, within the region defined by the seal, the apparatus being so constructed that the seal can only be released after the finger has been retracted.
2. Apparatus as claimed in claim 1 wherein the finger constitutes the end region of a liquid supply pipe or nozzle which is mounted in the fill head unit in axially movable manner.
3. Apparatus as claimed in claim 1 or 2 wherein the finger, or the pipe or nozzle of which it forms part, extend right through the fill head unit which provides the sealing means.
4. Apparatus as claimed in claim 1, 2 or 3 wherein the finger or the pipe or nozzle of which it forms part, is spring biassed into its retracted position.
5. Apparatus as claimed in any preceding claim wherein the finger, or the pipe or nozzle of which it forms part, is associated with a channel for supply of vacuum pressure and/or gas for purging or expansion of

the container.

6. Apparatus as claimed in claim 5 wherein the finger, or the pipes or nozzle of which it forms part, is mounted within a sleeve which defines the channel.

7. Apparatus as claimed in claim 6 wherein the sleeve is connected to the finger, or to the pipe or nozzle of which it forms part, for axial movement in unison therewith, relative to the fill head unit.

8. Apparatus as claimed in any preceding claim which is so constructed that the finger can only be protruded after the seal has been formed.

9. Apparatus as claimed in any preceding claim wherein the sealing means and the finger are actuatable by an interlinked hydraulic or pneumatic mechanism which is so designed as to release the seal by lifting the fill head unit only after retraction of the finger.

10. Apparatus as claimed in claim 9 wherein the mechanism is also so designed as to move the finger into its protruding position only after the seal has been formed by lowering the fill head unit.

11. Filling apparatus substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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